NORWALK RIVER BASIN

GEORGETOWN CONNECTICUT

FACTORY POND DAM
CT 00217

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JULY 1980

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Factory Pond Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Factory Pond Dam is a combination of sheet piling/concrete fill and masonry that is approx. 175 ft. long and 18.75 ft. high. The sheet piling portion of the dam consists of two rows of piling, 5 ft. apart, filled with concrete. The assessment of the dam is based on the visual inspection, past operational performance and hydraulic/hydrologic computations. The dam is judged to be in fair condition with several areas that require attention. The dam is classified as small and has a high hazard potential in accordance with guidelines established by the Corps of Engineers.

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FACTORY POND DAM

CT 00217

NORWALK RIVER BASIN

GEORGETOWN, CONNECTICUT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification Number:	CT 00217
Name:	Factory Pond Dam
Town:	Redding
County and State:	Fairfield County, Connecticut
Stream:	Norwalk River
Date of Inspection:	April 23, 1980

BRIEF ASSESSMENT

Factory Pond Dam is a combination of sheet piling/concrete fill and masonry that is approximately 175 feet long and 18.75 feet high. The sheet piling portion of the dam consists of two rows of piling, 5 feet apart, filled with concrete. The spillway is located on the southern portion of the dam and consists of a 75-foot long masonry weir. There is a 5-foot diameter discharge pipe that passes through the dam and an adjacent factory. Inside this pipe is a turbine that was once used for water power, but is now only used as a valve. The drainage area is 12.2 square miles and the reservoir has 92 acre-feet of available storage.

The assessment of the dam is based on the visual inspection, past operational performance and hydraulic/hydrologic computations. The dam is judged to be in fair condition with several areas that require attention. These areas include seepage in the vicinity of the west abutment of the spillway, concrete that needs repairing and masonry that needs repointing.

The dam is classified as small and has a high hazard potential in accordance with guidelines established by the Corps of Engineers. The test flood for this dam is 1/2 the Probable Maximum Flood (PMF). The test flood inflow is 9,640 cfs and the routed test flood outflow is 8,250 cfs. The test flood will overtop the dam by 4.25 feet.

It is recommended that the owner engage the services of a qualified registered engineer experienced in the design of dams to investigate the seepage through the dam and prepare a detailed hydraulic/hydrologic study to determine the spillway's adequacy.

Additional recommendations and remedial measures are included in Section 7 and should be implemented within one year after receipt of this Phase I Inspection Report.

Joseph F. Merluzzo
Connecticut P.E. #7639
Project Manager

Gary J. Giroux
Connecticut P.E. #11477
Project Engineer

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Inspections. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Inspection; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Test Flood is based on the estimated Probable Maximum Flood for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and variety of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Inspection does not include an assessment of the need for fences, gates, "no trespassing" signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with Occupational Safety and Hazard Administration's (OSHA) rules and regulations is also excluded.

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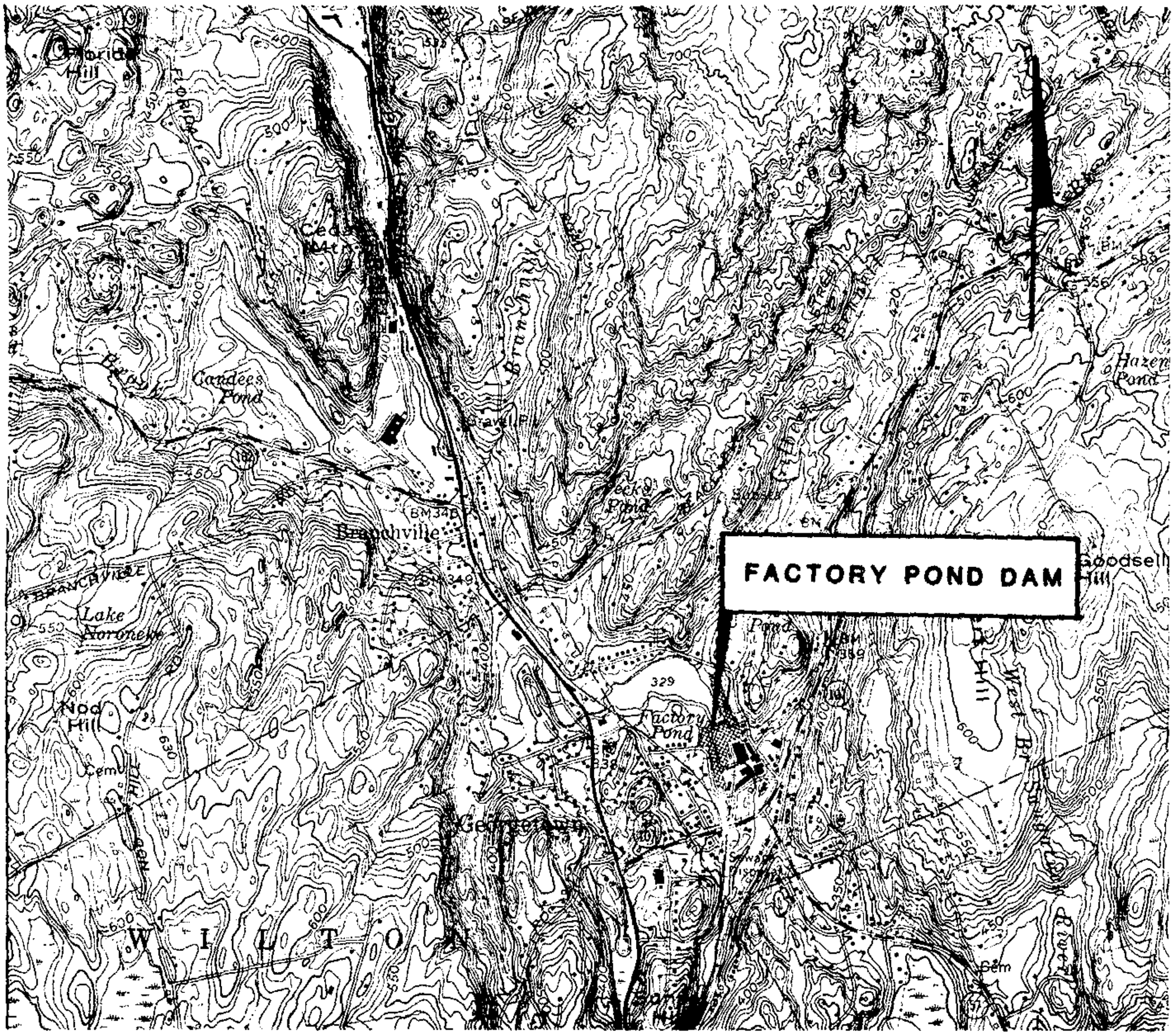
FACTORY POND DAM



QUADRANGLE: **BETHEL, CT**

US ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASS.	SCALE IN FEET 2000' 0 2000' 4000' 1" = 2000'
	LOCATION MAP

PHASE I INSPECTION REPORT

FACTORY POND DAM CT 00271

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority - Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspections throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Storch Engineers has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Storch Engineers under a letter of March 6, 1980 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0035 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection -

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location - Factory Pond Dam is located approximately 1,200 feet north of the Route 57 and Route 107 interchange and east of Route 7 in the Georgetown section of the Town of Redding, Connecticut (See Location Map). The coordinates of the dam are approximately 41°-15.5' north latitude and 73°-26' west longitude. The dam is located on the Norwalk River in the Norwalk River Basin.

b. Description of Dam and Appurtenances - Factory Pond Dam is a combination of sheet piling/concrete fill and masonry that is 175 feet long and 18.75 feet high. The sheet piling portion of the dam consists of two rows of sheet piling spaced 5 feet apart, with concrete fill in between. The sheet piling extends to 20 feet below the top of the dam.

The spillway is a stone masonry weir with an ogee section that is 75 feet long. The top of the dam is 4.65 feet above the spillway crest. The spillway is located on the southern portion of the dam adjacent to a factory building. There is a 10-foot downstream apron with the remainder of the channel being riprap.

There is a 5-foot diameter discharge conduit that is used to lower the pond for repairs to the dam. This conduit has a variable pitch blade turbine in it that was once used for water power. Presently, the turbine is not used for power but the blades are used as a control valve. Control of the blades is from inside the factory.

c. Size Classification - Factory Pond Dam has a maximum height of 18.75 feet and a maximum storage of 192 acre-feet at the top of the dam. In accordance with the Recommended Guidelines for Safety Inspection of Dams established by the Corps of Engineers, the dam is classified as intermediate (height less than 40 feet and storage less than 1,000 acre-feet).

d. Hazard Classification - Factory Pond Dam is classified as having a high hazard potential. Failure of the dam could result in the loss of more than a few lives and cause significant property damage. Approximately 50 feet downstream is a Gilbert & Bennett manufactoring building built immediately over the river. Estimated flow and water depths just prior to dam failure at this location is 2,500 cfs at 8.5 feet and just after dam failure is 5,710 cfs at 22 feet.

e. Ownership - The Factory Pond Dam is owned by:

Gilbert & Bennett
Georgetown, Connecticut

f. Operator - The person in charge of day-to-day operation of the dam is:

Mr. Dom Curtis
Gilbert & Bennett
Georgetown, Connecticut
(203) 544-8323

g. Purpose of Dam - The dam impounds the Factory Pond which serves as a primary water supply for industrial use by Gilbert & Bennett.

h. Design and Construction History - There are no design computations or drawings available for the original dam. During the Flood of "55", the dam was damaged as a result of water flowing through a low spot in the area of the west abutment. The water never overtopped the dam. The dam was reconstructed in 1956. Drawings are available for this reconstruction. Essentially, this reconstruction was of the western abutment, which is now sheet piling/concrete fill. The design was done by Industrial Associates, Inc., Philadelphia, Pennsylvania. In 1968, the masonry face was gunited.

i. Normal Operational Procedure - There is a regular maintenance staff at the plant that takes care of the dam. The water level of the pond is lowered if a major storm is imminent.

1.3 Pertinent Data

a. Drainage Area - Factory Pond drainage basin is in the Towns of Ridgefield, Redding, Wilton and Weston and is irregular in shape. The area of the drainage basin is 12.2 square miles (Appendix D - Plate 3). Approximately 10 percent of the drainage basin is natural storage and more than 80 percent is undeveloped. The topography is rolling with elevations ranging from 840 (NGVD) to 329 (NGVD) at the spillway crest.

b. Discharge at Damsite - There are no records available for discharge at the dam.

(1)	Outlet works (conduit) size:	60 inches
	Invert elevation (feet above NGVD):	319
	Discharge Capacity at top of dam:	40 cfs
(2)	Maximum known flood at damsite:	4,800 cfs
(3)	Ungated spillway capacity at top of dam:	2,500 cfs
	Elevation (NGVD):	333.65
(4)	Ungated spillway capacity at test flood elevation:	6,700 cfs
	Elevation (NGVD):	337.9
(5)	Gated spillway capacity at normal pool elevation:	N/A
	Elevation (NGVD):	N/A
(6)	Gated spillway capacity at test flood elevation:	N/A
	Elevation:	N/A
(7)	Total spillway capacity at test flood elevation:	6,700 cfs
	Elevation	337.9
(8)	Total project discharge at top of dam:	2,540 cfs
	Elevation (NGVD):	333.65

(9) Total project discharge at test flood elevation:	8,250 cfs
Elevation (NGVD):	337.9
c. Elevation (feet above NGVD)	
(1) Streambed at toe of dam:	314.9
(2) Bottom of cutoff:	313.65
(3) Maximum tailwater:	323.4
(4) Normal pool:	329
(5) Full flood control pool:	N/A
(6) Spillway crest (ungated):	329
(7) Design surcharge (original design):	unknown
(8) Top of dam:	333.65
(9) Test flood surcharge:	337.9
d. Reservoir (length in feet)	
(1) Normal pool:	1,700
(2) Flood control pool:	N/A
(3) Spillway crest pool:	1,700
(4) Top of dam:	1,800
(5) Test flood pool:	2,000
e. Storage (acre-feet)	
(1) Normal pool:	100
(2) Flood control pool:	N/A
(3) Spillway crest pool:	100
(4) Top of dam:	192
(5) Test flood pool:	282
f. Reservoir Surface (acres)	
(1) Normal pool:	16.5

	(2) Flood control pool:	N/A
	(3) Spillway crest:	16.5
	(4) Test flood pool:	23
	(5) Top of dam:	20
g.	Dam	
	(1) Type:	sheet piling/concrete fill & stone masonry
	(2) Length:	175
	(3) Height:	18.75
	(4) Top width:	5 feet
	(5) Side slopes:	vertical
	(6) Zoning:	unknown
	(7) Impervious core:	N/A
	(8) Cutoff:	sheet piling down to elevation 313.65 (NGVD)
	(9) Grout curtain:	unknown
	(10) Other:	N/A
h.	Diversion and Regulating Tunnel	N/A
i.	Spillway	
	(1) Type:	stone masonry weir/ogee
	(2) Length of weir:	75 feet
	(3) Crest elevation (without flashboard):	329
	(4) Gates:	N/A
	(5) U/S channel:	no channel-natural pond bottom
	(6) D/S channel:	concrete apron and riprapped channel

(7) General:	N/A
j. Regulating Outlets	
(1) Invert elevation (NGVD):	319
(2) Size:	60 inches
(3) Description:	cast iron pipe
(4) Control Mechanism	manually operated gate
(5) Other:	valve is the variable pitch blades of the turbine

SECTION 2 - ENGINEERING DATA

2.1 Design Data

There are no design computations or drawings for the original dam. However, there are drawings for the reconstructed portion of the dam that was damaged during the Flood of October, 1955. These drawings were prepared by Industrial Associates, Inc. of Philadelphia, Pennsylvania (See Appendix B).

2.2 Construction Data

No records are available for the original construction or the reconstruction. Drawings for the reconstruction are available (Appendix B).

2.3 Operation Data

The gate for the 5-foot diameter discharge conduit is operable and it is exercised periodically to lower the pond. Also, when the threat of a major storm is imminent, the pond is lowered.

2.4 Evaluation of Data

a. Availability - There were no computations available, however, there are some drawings available. These drawings are available from the Department of Environmental Protection (DEP).

b. Adequacy - The information made available along with the visual inspection, past performance history and hydraulic/hydrologic assumptions were adequate to assess the condition of the facility.

c. Validity - Due to the lack of available data, the conclusions and recommendations found in this report are based on the visual inspection and hydraulic/hydrologic computations.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General - The visual inspection was conducted on April 23, 1980 by members of the engineering staff of Storch Engineers, D. Baugh and Associates, Inc. and Matthews Associates with the help of Mr. Peter Harco and Dom Curtis of Gilbert & Bennett. A copy of the visual inspection check list is contained in Appendix A of this report. Selected photos of the dam and appurtenant structures are contained in Appendix C.

In general, the overall appearance and condition of the facility and its appurtenant structures is fair.

b. Dam - The dam is a combination of sheet piling/concrete fill and masonry. The sheet piling and concrete fill are in good condition (Photo 1). The sheet piling is painted with some areas that are rusting. The concrete cap is in good condition with no cracking (Photo 3). There is no evidence of settlement or lateral movement. There are some areas along the toe where vegetation is growing (Photo 1). The masonry portion of the dam is fair with some joints in need of repointing (Photo 8).

c. Appurtenant Structures - The inlet to the discharge conduit is protected by a bar screen which is in good condition. The discharge conduit itself was underwater and could not be inspected (Photo 8). The conduit contains a power turbine which is not used. The control for this conduit is by varying the pitch on the blades of the turbine. The gate is operable and the conduit was in use at the time of inspection.

The spillway is a fixed weir that appears to be in fair condition (Photos 2 and 5). The downstream training wall and western abutment (Photos 1 and 6) show some seepage and cracks.

d. Reservoir Area - The area immediately adjacent to the facility is gently sloped and in a natural state. The shoreline shows no signs of sloughing or erosion. There is some development adjacent to the reservoir, which is in the form of warehouses owned by Gilbert & Bennett. A rapid rise in the water level of the reservoir will not endanger any life or property.

e. Downstream Channel - The channel from the spillway is confined by buildings and many bridges (Photos 3, 4 and 7). It is a stone lined, but its capacity is questionable. Immediately downstream, the channel passes under a building (Photo 4). Under a large flow, the pier shown in the picture and the building may be destroyed.

3.2 Evaluation

Overall, the general condition of the dam is fair. The visual inspection revealed items that lead to this assessment, and apparent areas of distress such as:

a. Seepage through the abutment.

b. Need for repointing of the masonry.

c. Vegetation along the toe of the dam.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General - The operation of this facility is strictly for the purpose of industrial use, and the water level is kept as full as possible. Water for industrial use is pumped out. The pond is lowered once a year when manufacturing operations are shut down.

b. Description of Any Warning System in Effect - The only formal operating procedure is when there is a threat of a substantial storm. When this occurs, the gate to the 5-foot diameter conduit is opened and the water level in the pond is lowered (5 feet in 24 hours). There is no system for warning downstream inhabitants.

4.2 Maintenance Procedures

a. General - The pond is drained each year during the manufacturing shut down. At this time, the mortar is repaired and the cracks are filled.

b. Operating Facilities - The gate to the 5-foot discharge conduit was taken apart and refurbished approximately ten years ago.

4.3 Evaluation

The dam is maintained on an annual basis. Although they do lower the pond prior to a major storm, there should be a formal warning system for downstream flooding.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Factory Pond Dam is a sheet piling/concrete fill and masonry dam approximately 175 feet long and 18.75 feet high. The spillway is a masonry weir, 75 feet long. The 5-foot diameter conduit is ued to lower the pond before a major storm and according to maintenance personnel, it takes 24 hours to lower the pond 5 feet (14.2 acres x 5.0 feet ÷ 24 hours = 35.8 cfs). Compared to the test flood, this flow is small. Therefore, this conduit is not in the hydrologic analysis.

The watershed encompasses 12.2 square miles and is 80 percent undeveloped. The topography is rolling with the terrain rising 511 feet from the spillway crest.

The pond has a total capacity of 192 acre-feet when the pond is at the top of the embankment and 100 acre-feet at the spillway crest. Therefore, there is approximately 92 acre-feet of storage available. The test flood outflow for this dam is 8,250 cfs and the spillway capacity is 2,500 cfs or approximately 30% of the test flood outflow.

5.2 Design Data

No design data is available.

5.3 Experience Data

Factory Pond Dam has experienced all the major storms of the 1930's and 1950's and most recently January, 1979. The flood of record resulted from the storm of October, 1955. The discharge at the site was approximately 4,800 cfs and the western portion of the dam was damaged, resulting in its reconstruction.

5.4 Test Flood Analysis

Based on the guidelines found in the Recommended Guidelines for Safety Inspection of Dams, the dam is classified as a small structure with a high hazard potential. The test flood for these conditions ranges from 1/2 the Probable Maximum Flood (PMF) to the PMF. One half the PMF was used for this dam because of the small size.

Using the guide curves established by the Corps of Engineers (rolling terrain), the test flood inflow is 9,640 cfs. The routing procedure established by the Corps gives an approximate outflow of 8,250 cfs. The spillway capacity is approximately 2,500 cfs or approximately 30% of the test flood outflow. The test flood will overtop the dam by approximately 4.3 feet. The building over the spillway (Photos 1 and 2) will not affect the test flood outflow.

Storage behind the dam was assumed to begin at the spillway crest. Storage was determined by an average area depth analysis. Capacity curves for the spillway assumed weir flow.

5.5 Dam Failure Analysis

A dam failure analysis was performed using the Rule of Thumb method in accordance with guidelines established by the Corps of Engineers. Failure was assumed to occur when the water level in the reservoir was at the top of the dam.

The spillway discharge just prior to dam failure is 2,500 cfs and will produce a depth of flow of approximately 8.5 feet immediately downstream (at Gilbert & Bennett's building over the channel) from the dam. The calculated dam failure discharge is 5,710 cfs and will produce a depth of flow of approximately 22 feet immediately downstream from the dam or an increase in water depth at failure of approximately 13.5 feet. The failure analysis covered a distance of approximately 1,000 feet downstream where the depth of flow was calculated to be 4.5 feet.

Failure of Factory Pond Dam may result in the loss of more than a few lives and the flood wave will destroy portions of the Gilbert & Bennett Factory which was constructed over the river 50 feet downstream. Also at least two dwellings located approximately 1,500 feet downstream will sustain some damage.

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The general structural stability of the dam is good as evidenced by the vertical, horizontal and lateral alignment. The mortared stone spillway is in fair condition with some cracks in the concrete at the westerly end. The steel sheet piling is in good condition.

The only area of concern is at the western abutment/training wall where there is some cracking and some seepage. This seepage, at the time of inspection, was negligible.

6.2 Design and Construction Data

The original design and construction data are not available. There are construction drawings available for the reconstruction of the dam.

6.3 Post-Construction Changes

Since the reconstruction of the dam, the only changes, except for minor maintenance work, are the guniting of the stone masonry face of the spillway in 1968 and the addition of the covered passageway over the dam (Appendix B - Plate 1). One of the piers for this passageway was constructed across the outlet channel. This outlet channel has since ceased to function.

6.4 Seismic Stability

The dam is located in Seismic Zone 1 and in accordance with Recommended Phase I Guidelines does not warrant a seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition - After consideration of the available information, the results of the inspection, contact with the owner and hydraulic/hydrologic computations, the general condition of the Factory Pond Dam is fair.

b. Adequacy of Information - The information available is such that an assessment of the safety of the dam should be based on the available data, the visual inspection results, past operational performance of the dam and its appurtenant structures and computations developed for this report.

c. Urgency - It is considered that the recommendations suggested below be implemented within one year after receipt of this Phase I Inspection Report.

7.2 Recommendations

The following recommendations should be carried out under the direction of a qualified registered engineer.

a. Seepage through the spillway abutment should be investigated further to determine its origin and monitored to determine any changes.

b. Prepare a detailed hydraulic/hydrologic study to determine spillway adequacy and an increase of the total project discharge if necessary.

7.3 Remedial Measures

a. Operation and Maintenance Procedures -

(1) Repair all cracks and mortar all joints in the masonry portion of the dam.

(2) Vegetation along the toe of the dam should be removed. This will facilitate the visual observation of existing and potential seepage.

(3) Plans for around-the-clock surveillance should be developed for periods of unusually heavy rains and a formal warning system should be put into operation for use in the event of an emergency.

(4) A program of annual technical inspection should be established.

7.4 Alternatives

None.

Information pertaining to the history, maintenance and modification to Factory Pond Dam as well as copies of past reports are located at:

State of Connecticut
Department of Environmental Protection
Water Resources Unit
State Office Building
Hartford, Connecticut 06115

APPENDIX A

INSPECTION CHECK LIST

INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT FACTORY POND DAM

DATE 4/23/80

TIME 9:00 a.m.

WEATHER Clear

W.S. ELEV.______ U.S.______ DN.S.

PARTY:

1. John F. Schearer , SE Civil
2. John Pozzato , MA Mech.
3. Kenneth J. Pudeler, SE Civil
4. Michael Haire , DBA Struct/Geo.
5. Peter Austin , DBA Civil
6. Peter Harco Gilbert & Bennett
7.
8.
9.
10.

PROJECT FEATURE	INSPECTED BY	REMARKS
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

INSPECTION CHECK LIST

PROJECT FACTORY POND DAM DATE 4/23/80

PROJECT FEATURE ______ NAME ______

DISCIPLINE ______ NAME ______

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	Fair
Current Pool Elevation	Fair
Maximum Impoundment to Date	Never overtopped
Surface Cracks	Few (minor)
Pavement Condition	N/A
Movement or Settlement of Crest	None observed
Lateral Movement	Overall-good;
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Cracked joints noted in spillway side abutment
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	Not allowed
Vegitation on Slopes	None
Sloughing or Erosion of Slopes or Abutments	None
Rock Slope Protection - Riprap Failures	N/A
Unusual Movement or Cracking at or near Toes	None
Unusual Embankment or Downstream Seepage	Negligable
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

INSPECTION CHECK LIST

PROJECT FACTORY POND DAM

DATE 4/23/80

PROJECT FEATURE

NAME

DISCIPLINE

NAME

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
a. Approach Channel	
Slope Conditions	Good
Bottom Conditions	Good
Rock Slides or Falls	None
Log Boom	Good condition (spans pond)
Debris	Negligable (periodically cleaned out)
Condition of Concrete Lining	None observed
Drains or Weep Holes	None
b. Intake Structure	
Condition of Concrete	Good
Stop Logs and Slots	Good

INSPECTION CHECK LIST

PROJECT FACTORY POND DAM DATE 4/23/80

PROJECT FEATURE ______ NAME ______

DISCIPLINE ______ NAME ______

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	N/A
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	None
Float Wells	None
Crane Hoist	None
Elevator	None
Hydraulic System	None
Service Gates	1-5' Penstock, Hand-operated worm gear - good condition.
Emergency Gates	Process water used by factory: valve pit & 10" hand valve - good condition
Lightning Protection System	None
Emergency Power System	None
Wiring and Lighting System in Gate Chamber	Within factory bldg., in good condition

INSPECTION CHECK LIST

PROJECT FACTORY POND DAM

DATE 4/23/80

PROJECT FEATURE

NAME

DISCIPLINE

NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	Inaccessable
General Condition of Concrete	"
Rust or Staining on Concrete	"
Spalling	"
Erosion or Cavitation	"
Cracking	"
Alignment of Monoliths	"
Alignment of Joints	"
Numbering of Monoliths	"

INSPECTION CHECK LIST

PROJECT: FACTORY POND DAM

DATE: 4/23/80

PROJECT FEATURE:

NAME:

DISCIPLINE:

NAME:

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of ~~Concrete~~ Stone masonry	Fair
Rust or Staining	N/A
Spalling	None
Erosion or Cavitation	None
Visible Reinforcing	None
Any Seepage or Efflorescence	None
Condition at Joints	Fair
Drain holes	Fair
Channel	
Loose Rock or Trees Overhanging Channel	None
Condition of Discharge Channel	Good

INSPECTION CHECK LIST

PROJECT: FACTORY POND DAM | DATE: 4/23/80

PROJECT FEATURE: | NAME:

DISCIPLINE: | NAME:

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Underwater
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Silted, otherwise good
b. Weir and Training Walls	
General Condition of Concrete	Good, but mortared joints on westerly training wall and abutting weir conc. cracked.
Rust or Staining	None
Spalling	None
Any Visible Reinforcing	None
Any Seepage or Efflorescence	Minor - westerly training wall/abutment
Drain Holes	None
c. Discharge Channel	
General Condition	Fair
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Channel	Good
Other Obstructions	Several walkway bridges and buildings overhang the channel

INSPECTION CHECK LIST

PROJECT FACTORY POND DAM

DATE 4/23/80

PROJECT FEATURE

NAME

DISCIPLINE

NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	N/A
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

APPENDIX B

ENGINEERING DATA

NEW YORK LICENSE 4755
CONNECTICUT REGISTRATION 4

JOSEPH W. CONE
CIVIL ENGINEER
124 HAVEMEYER PLACE
GREENWICH, CONNECTICUT

TELEPHONE
TOWNSEND 9-2152

May 21, 1963

Mr. Emitt A. Dell, Field Inspector
Water Resources Commission
State Office Building
Hartford 15, Conn.

Re: Dam #1 Norwalk River
Gilbert & Bennett, Mfg. Co.

Dear Mr. Dell:

As requested, I inspected the above captioned dam on May 8, 1963. Many material changes have been made since I last saw the dam on August 13, 1957, when I read the weir gauge at the leak and estimated total flow at about 400,000 g.p.d. with FL in pond down about 6'. On May 8, '63 flow appeared to be greater than on August 13, '57 and I estimated flow at about 500,000 g.p.d., including small flows near west abutment of spillway. Flow at main leak shows in photo #2 enclosed.

More important reference correspondence

(1) Dec. 23 '58 Cone to Wise

(2) Jan. 9 '59 Mulliken to Wise

(3) Feb. 1 '61 " " "

(4) Feb. 8 '61 Cone " " re (3)

The material changes are shown very approximately on the enclosed photo of a topo sheet and not to scale.

Nos. 1 & 2 - New buildings

No. 3 - Channel widening and under old buildings. Do not know increased area. But this has no particular relation with safety of dam.

Several piers are in channel for future building construction.

No. 4 - Combined retaining and training wall; retaining to hold fill and presumably future building; training to direct flow lines from sluice gate.

No. 5 - Drive through gate in fence from upper level El. 104.5±, datum spillway crest at 100.0, to lower level at building (2).

No. 6 - Leaks in sluice gate chute and at west end of dam to be corrected.

No. 7 - Suggest walls be raised as noted hereinafter.

No. 8 - Entire area has been raised several feet above El. 104.5 by material excavated for new building at (2).

No. 9 - Leaks at west end.

In addition: (a) Channel through grounds has been improved; (b) New bridge with greater waterway area at Route #465; (c) New twin box culvert added at new road Route #53.

Incidentally, I understand that new waterways at Route #465 and Route #53 will pass at least 2200 cfs with the usual clearance requirement of 2' between design flood water surface and underside of deck. The combination of old and new box culverts at Route #53 under severe flood conditions can pass about 4000 cfs with H of 3' and Vm less than 10.

I would observe that design flood flow for passing floods through a valley is an entirely different matter than design flood flow for a dam; design for the one is influenced largely by the B-C ratio (benefit to cost); the design for a dam is imperatively concerned with safety.

Leak. The leak at and near the sluiceway of about 500,000 g.p.d. could become a serious matter and cause failure of the westerly portion of the dam. Leaks must be controlled; therefore Recommendation No. 2.

A weir was installed in August 1957 to determine whether or not flow varied with changes in flow line of pond. The plant superintendent said he would have his plant carpenter note readings on the gauge and report to me. I instructed the carpenter how to measure from a mark on the gauge to water surface. No readings were furnished me. I did take one reading on Aug. 13, 1963.

Sheet Piling. Top of piling as shown on photo #1 averages over 1 foot below top of west masonry abutment and wall. I understand piles were 20' long and are tied to anchors and therefore are at minimum depth in original ground. Steel will deteriorate in about twenty years to a condition requiring filling sluiceway with solid concrete to protect west end of main dam. Conditions must be checked periodically.

Conditions Now. Again referring to photo #1. This photo was taken from top of training wall at bend in same. The wall does not show in the left portion of the photo but it does reinforce toe of pavement to the extent that there is less likelihood of piling kicking out when dam is overtopped and scouring takes place. Also concrete, shown in photo to left of pipe, tends to reinforce paving.

To right of photo, but not shown, is the old projecting abutment wall. There are small leaks here and some stone in base moved. This area should be reinforced with massive concrete; therefore Recommendation No. 3.

Spillway. The old spillway could pass approximately 1100 cfs without serious overtopping. My estimate is that flood of October '55 was at least 4000 cfs at the dam. I was told there was only minor flow over east abutment in '53. Therefore the west end of dam must have failed at a flow of 1100 cfs or less or at less than one third of probable maximum flow.

Cone's letter (1) Dec. 23 '58 recommended among other matters --- "(3) Extend the overflow masonry dam to full width of the valley".

Mulliken's letter (3) Feb. 1 '61. "We recently developed a scheme to construct additional spillway capacity to the west of our present dam------". And "As soon as a drawing has been completed, we will send you a copy for your preliminary study----". I have never seen such plan.

This extension of the spillway would have provided a total capacity of over 4200 cfs with present H of 4.6 and new length 130' effective ($Q = 3.4 \times 130 \times 4.6^{3/2}$ (9.8) = 4230 cfs). And with H = 6 - 6500 cfs.

But the new building, walls, drives, etc. at #2 have most effectively checkmated this proposed solution which was practical and safe. Consequently I suggest raising all abutment walls to provide H = 7 as shown in recommendations.

As for the proposed diversion canal and conduits, this proposal is also blocked. However I always considered this a pipe-dream and not to be considered seriously.

It is my opinion that if additional spillway capacity is not provided the westerly portion of the dam will again fail due to overtopping and consequential scouring during a major flood.

I would remark that whatever Q was in October 1955 a future storm, in about 25 years, identical in every characteristic with 1955 storm would produce a much greater Q even up to 25%, because of:- (a) More intensive land use; (b) New bridges and culverts with greater waterway, thereby reducing valley storage; (c) Encroachment on and filling low areas, thereby again reducing valley storage; (d) Draining low areas.

I do not presently recommend an order to remove the dam once and for all, economic and other implications are evident.

I do recommend an order to make the corrections enumerated below or others of equivalent performance.

(1) Owner furnish a map of conditions as they now are, showing in plan and elevations complete information. Particular reference to building (1) and old buildings and walls at (7). I have never seen a plan of this dam.

(2) Effectively stop leaks at (9) west end of dam by grouting or otherwise.

(3) When pipe at leaks has been completed and leaks stopped, place huge block of concrete between training wall and end of sluiceway and against bottom of spillway west abutment to reinforce same.

(4) Raise walls at (7), to not less than El. 7.0 (west abutment and walls protecting old building) - this means raising about 2.5' minimum.

(5) Uncover and measure upstream face of spillway to determine whether or not section is safe under extra H of 2.5'. If not safe reinforce front of dam with concrete.

Purpose of the above is to pass a reasonable design flood without washing out the westerly portion, as occurred in 1955, resulting in material damage not only to Gilbert and Bennett but to other properties and highway structures downstream.

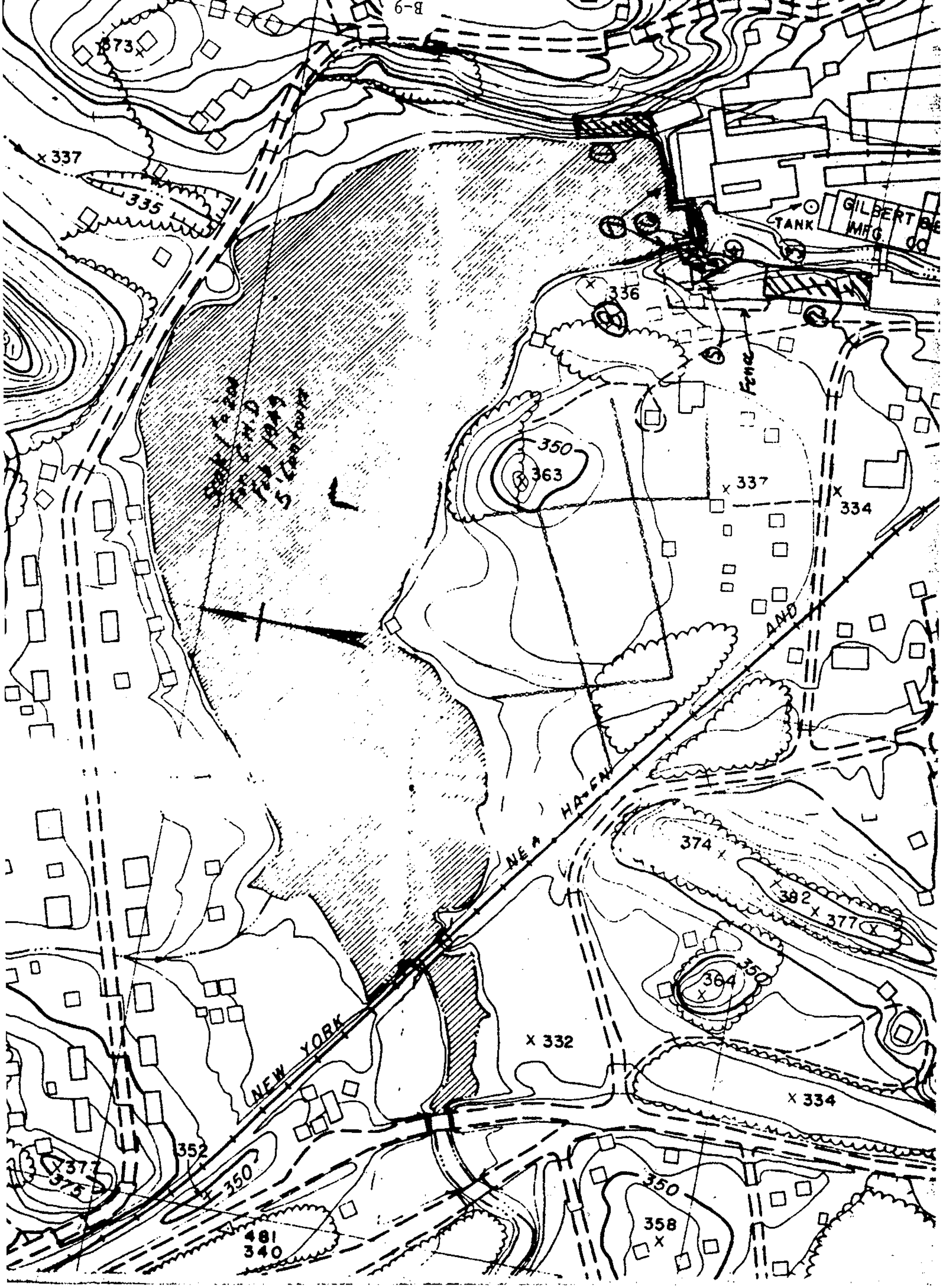
Enclosed are two photographs, photo of general data notes and print of revised Recurrence Curve for Conn. Formula.

Yours very truly,

J. W. Cone

J. W. Cone

JWC/dr
Enc: 2 photographs
2 prints



373
337
335
336
TANK
GILBERT
MFG CO
Fence
350
363
337
334
AND
NEW YORK
374
382
377
364
350
332
334
352
372
375
350
350
358
481
340

4 Photos

GEN. NOTES 5/20/63

Max Q without ace topping

Old Spillway	1050 cfs. with H = 2.7	
Present "	2250 " " H = 4.6	
'55 Flood	3100 " on 8± sq. mi by USGS	
" " ≑	400± " per sq mi on 8 sq mi	
Watershed	12.1 sq.mi at dam	
'55 Flood	4800± c.f.s. (400x12) at dam Rough Q prob. some too high for dam.	
Proposed Spillway	4000 c.f.s with H=7 minimum	
MAF	850 c.f.s with C_B=1 by Conc	
Rough " check	810 " wgtd. aver. of 8 small sheds	

Min. design H = 7 } $R = \frac{Q}{MAF} = \frac{4000 \text{ cfs}}{800} = 5 \doteq 0.66\%$ chance (150 yr)

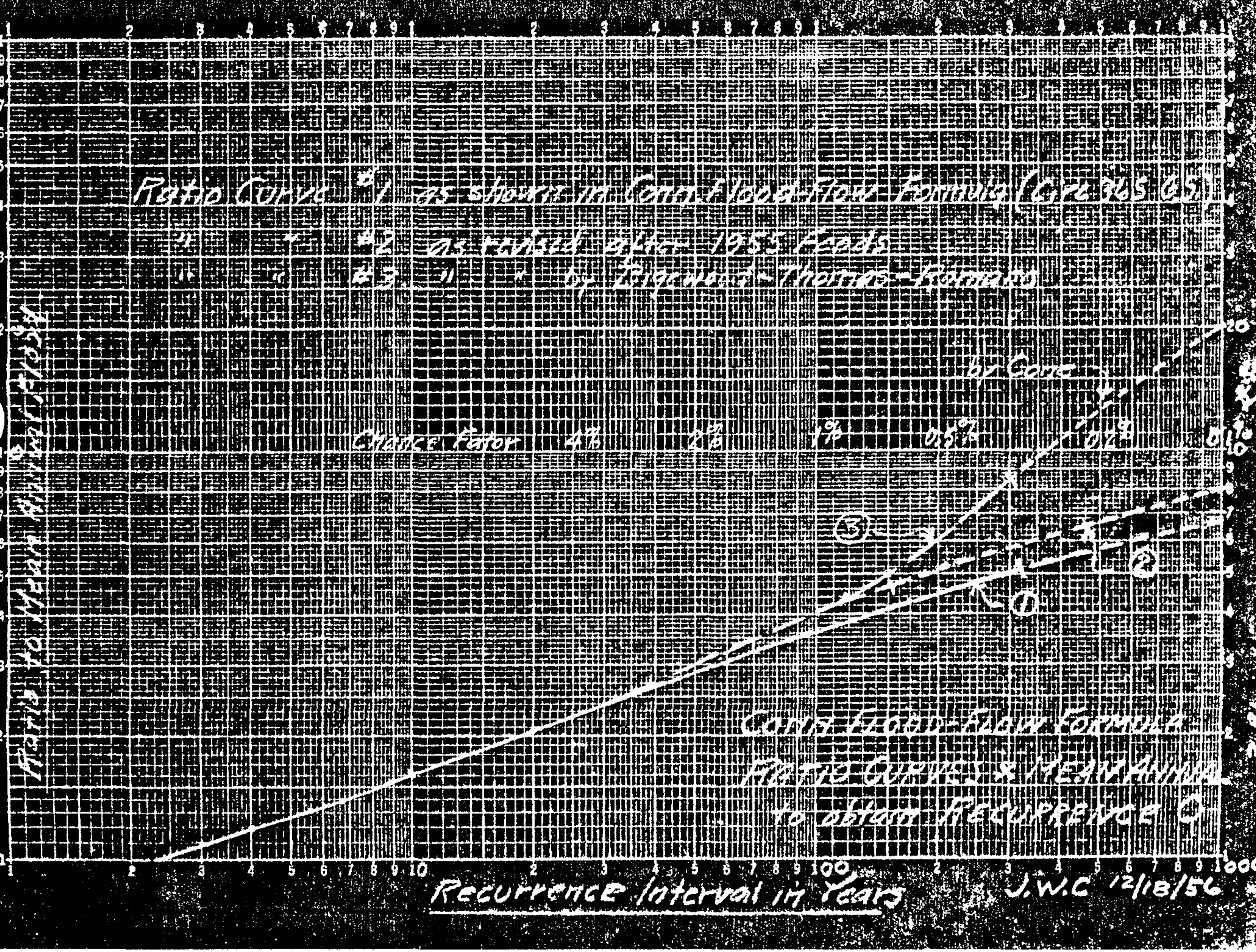
'55 R $\frac{4800}{800} = 6 \doteq 0.5\%$ " (200 yr)

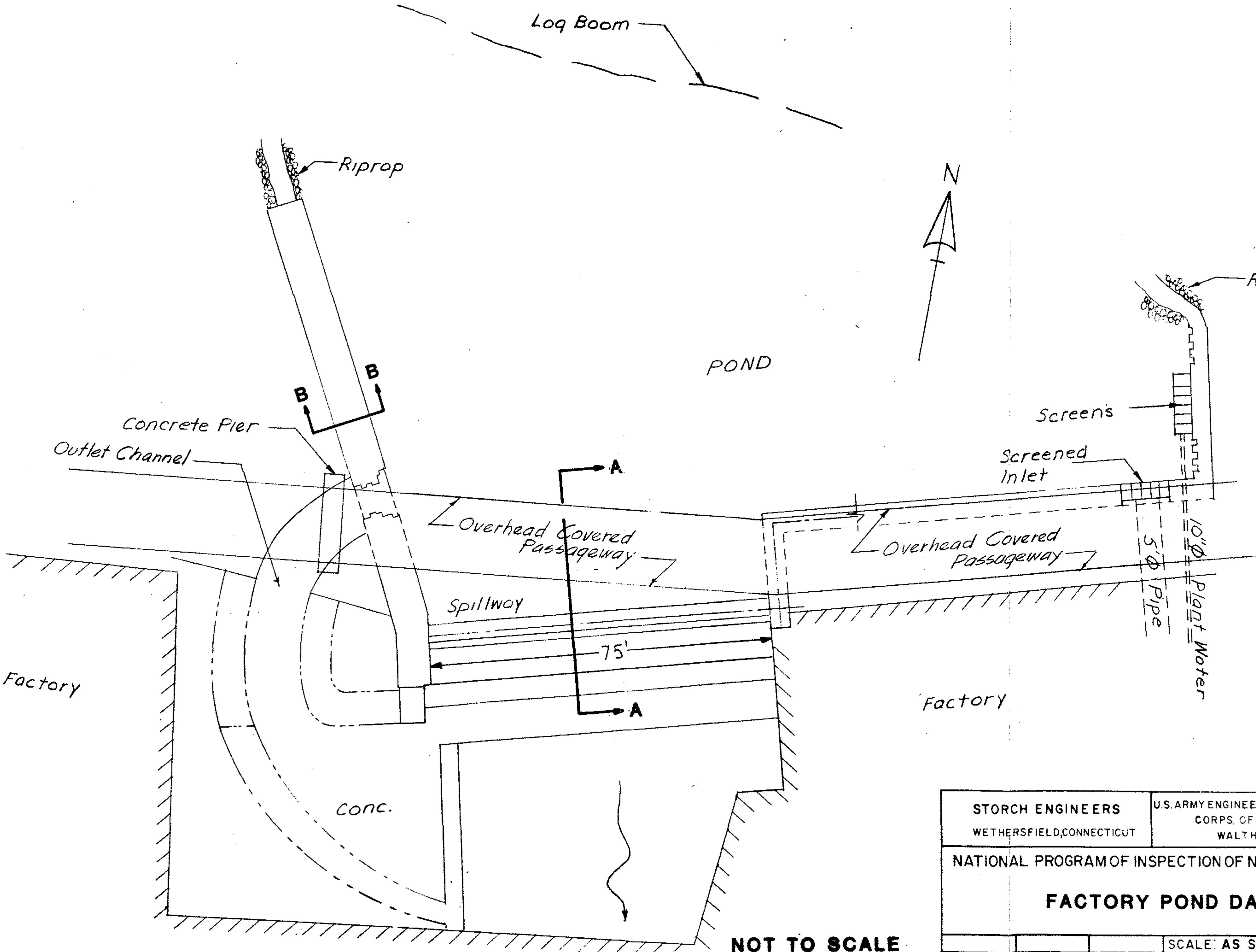
Total precip.	12"	Danbury	Oct 14-17 incl '55
" "	9.6	Derby.	"
"	13.8	Stamford.	"
Precip of	9"	Prob max in 24 hr on 12 sq.mi and approx R is .7% (150 yr)	

But prob nearly max runoff because of antecedent rain with swamps and brooks full.

1" per hr on 12 s.m 7,680 cfs if 100% runoff.

1010


Ratio Curve #1 as shown in Conn Flood-Flow Formula (Circ 365 G.S.)
" " #2 as revised after 1955 Floods
Chance Factor 4% 2% 1% 0.5% 0.2%
by Conn
③
②
①
Mean annual flood ratio
CONN FLOOD-FLOW FORMULA
RATIO CURVES & MEAN ANNUAL
to obtain RECURRENCE Q
Recurrence Interval in Years
J.W.C 12/18/56



NOT TO SCALE

PLATE 1

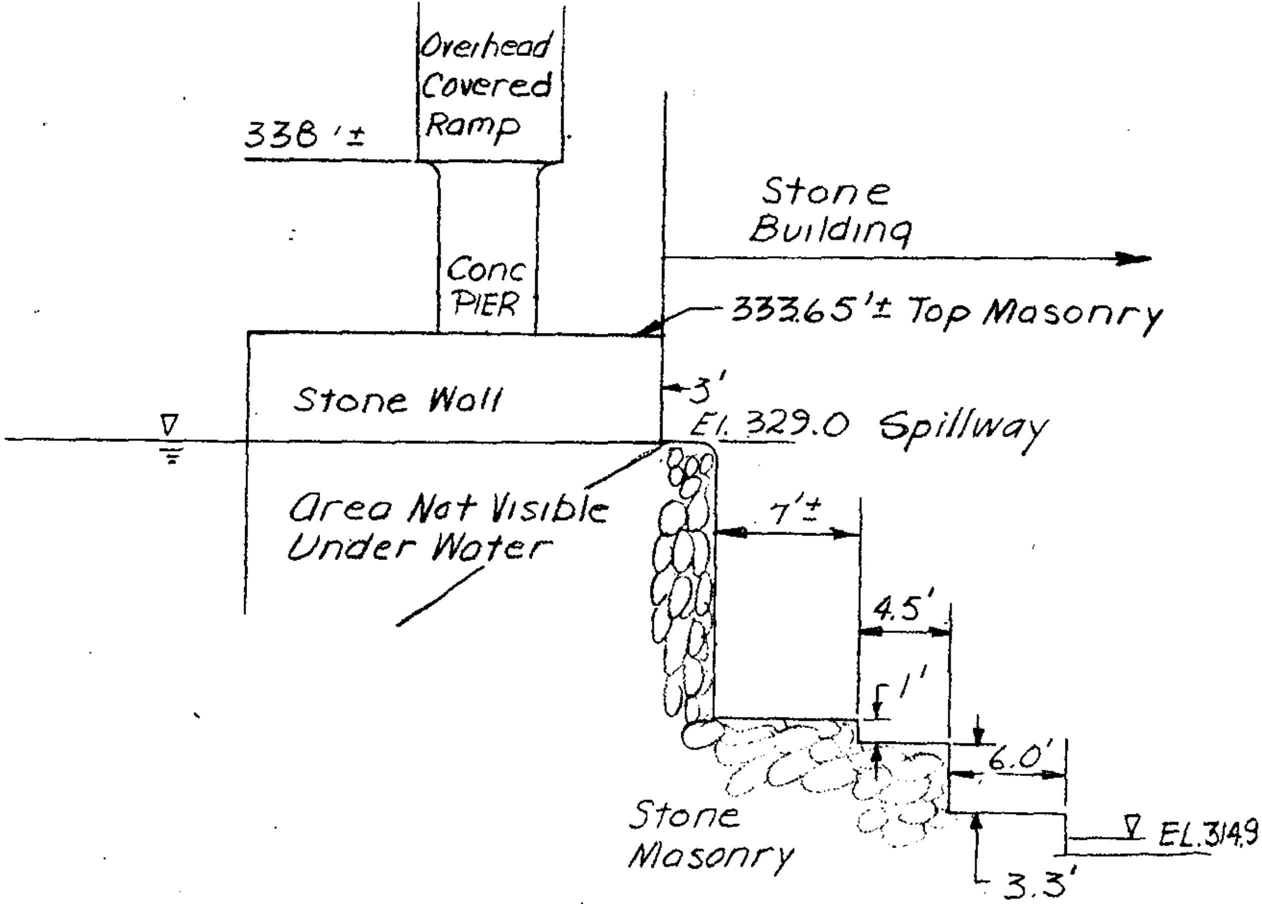
STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

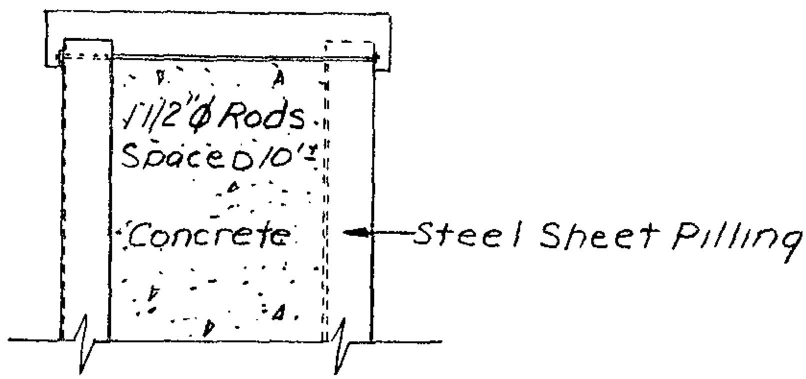
FACTORY POND DAM

SCALE: AS SHOWN

DATE: JULY 1980



SECTION A-A



SECTION B-B

PLATE 2

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS. OF ENGINEERS WALTHAM MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

FACTORY POND DAM

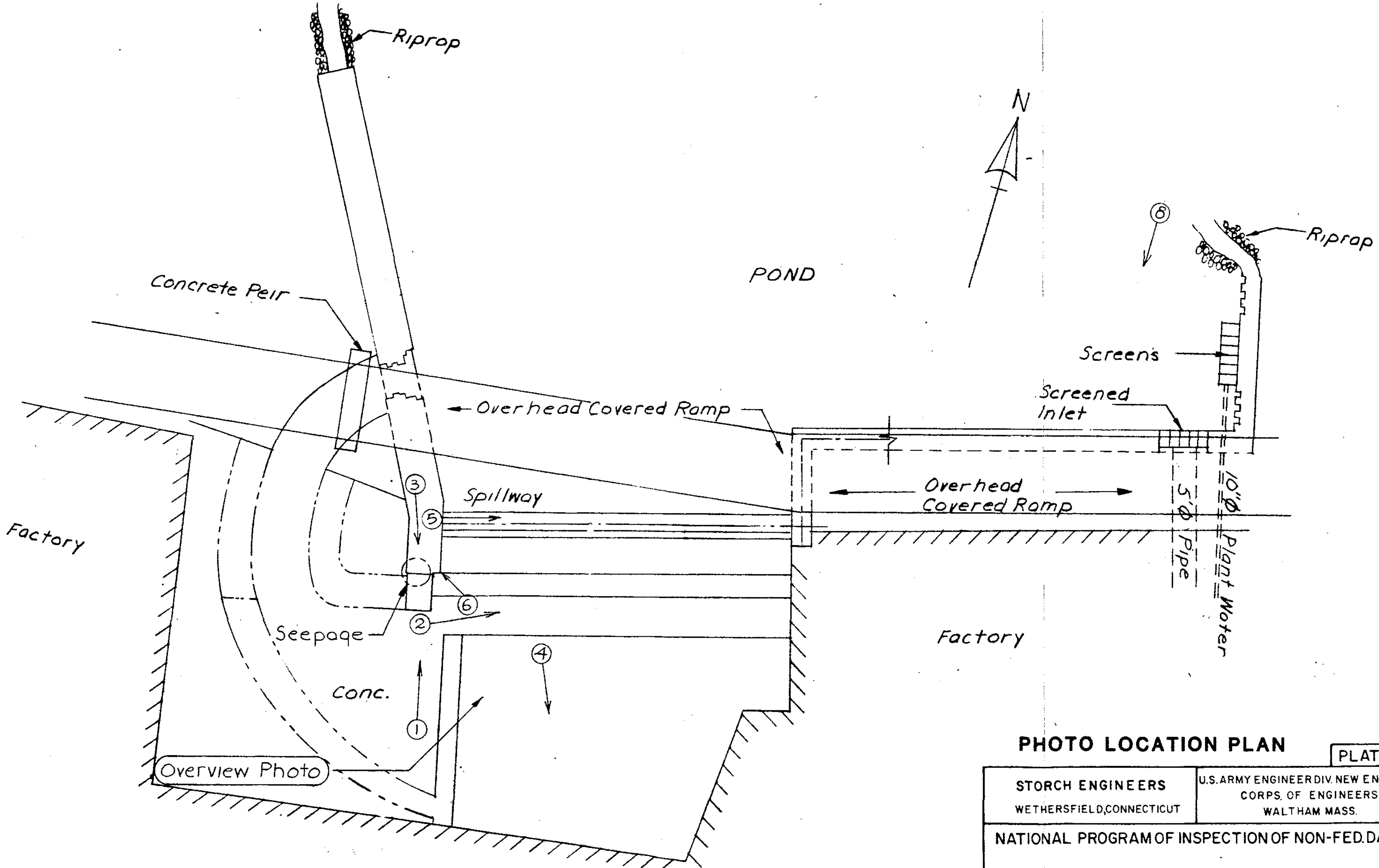
NOT TO SCALE

SCALE: AS SHOWN

DATE: JULY 1980

APPENDIX C

PHOTOGRAPHS



NOT TO SCALE

PHOTO LOCATION PLAN

PLATE 3

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS. OF ENGINEERS WALTHAM MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

FACTORY POND DAM

SCALE: AS SHOWN

DATE: JULY 1980

PHOTO 1

DOWNSTREAM FACE OF DAM

PHOTO 2

DOWNSTREAM FACE OF DAM

PHOTO 3

DOWNSTREAM CHANNEL

PHOTO 4

DOWNSTREAM CHANNEL

PHOTO 6

SEEPAGE THROUGH WEST SPILLWAY ABUTMENT

PHOTO 5

SPILLWAY CREST

PHOTO 7

DOWNSTREAM CHANNEL

PHOTO 8

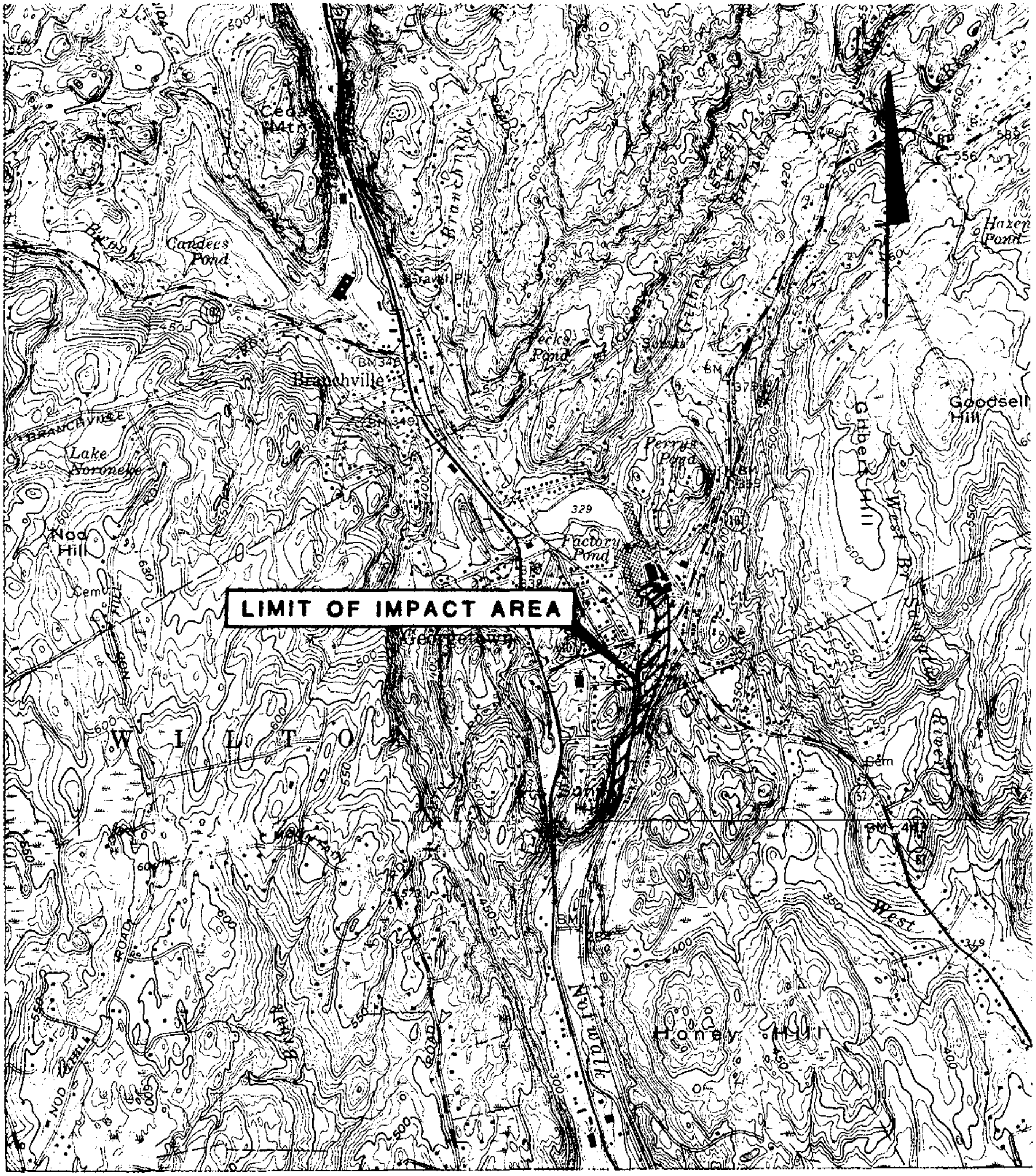
SCREEN & DIVERSION INTAKE

UPSTREAM FACE OF DAM

C-IV

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



scale 1:24000

PLATE 4

STORCH ENGINEERS WETHERSFIELD,CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

FACTORY POND DAM

SCALE: AS SHOWN

DATE JULY 1980

STORCH ENGINEERS
Engineers - Landscape Architects
Planners - Environmental Consultants

JOB Phase I Dam Inspection - #4463
SHEET NO. 1 OF 9
CALCULATED BY GJG DATE 7/11/80
CHECKED BY RDC DATE 7/15/80
Determination of Test Flood

NAME OF DAM Factory Pond Dam

DRAINAGE AREA 12.2 SM

INFLOW $\frac{1}{2}$ PMF = $\frac{1}{2}$(1580 × 12.2) = 9638 cfs

Estimating the effect of surcharge storage on the Maximum Probable Discharges

1. Q_{P1} = 9640 cfs
2a. H_1 = 9.8' (elev.)
b. $STOR_1$ = 0.315"
c. $Q_{P2} = Q_{P1}(1 - STOR_1/19)$ = 9480 cfs
3a. H_2 = 9.6' $STOR_2$ = 0.30
b. $STOR_A$ = 0.307
Q_{PA} = 9330 cfs
H_A = 9.7" $STOR_A$ = 0.307

Test Flood = 9330 cfs

Capacity of the spillway when the pond elevation is at the top of the dam

Q = 2500 cfs or 27 % of the Test Flood

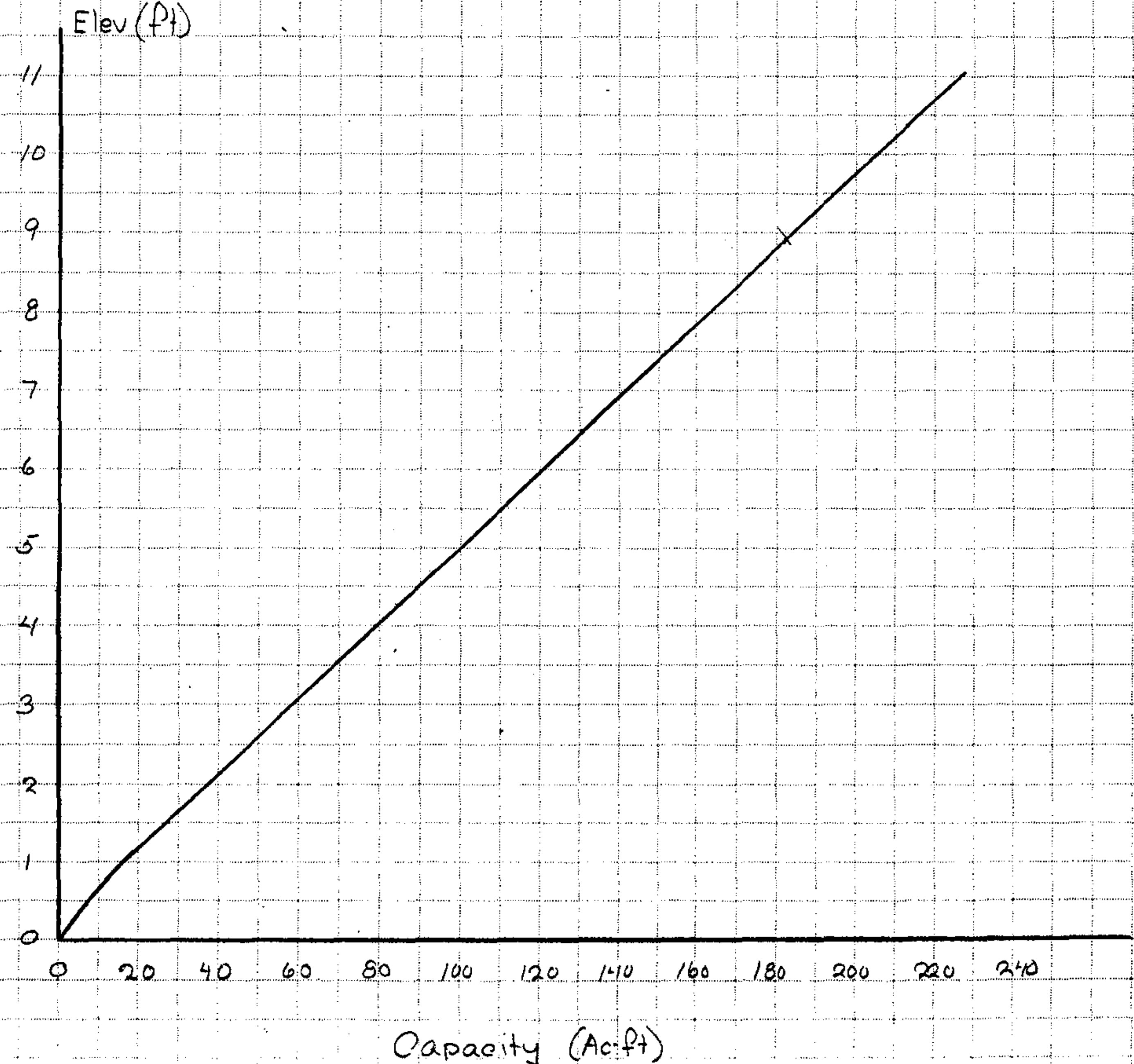
STORCH ENGINEERS
Engineers - Landscape Architects
Planners - Environmental Consultants

JOB Phase I Dam Inspection 4463
SHEET NO. 2 OF 9
CALCULATED BY GJG DATE 4/16/80
CHECKED BY RDC DATE 7/15/80

AREA - CAPACITY

Name of Dam: FACTORY POND DAM

ELEV	DEPTH	AREA	AVG.AREA	VOL	Σ VOL
0.0		16.5			0.0
	1.0		16.8	16.8	
1.0		17.0			16.8
	10.0		20.9	209	
11.0		24.8			226



STORCH ENGINEERS
Engineers - Landscape Architects
Planners - Environmental Consultants

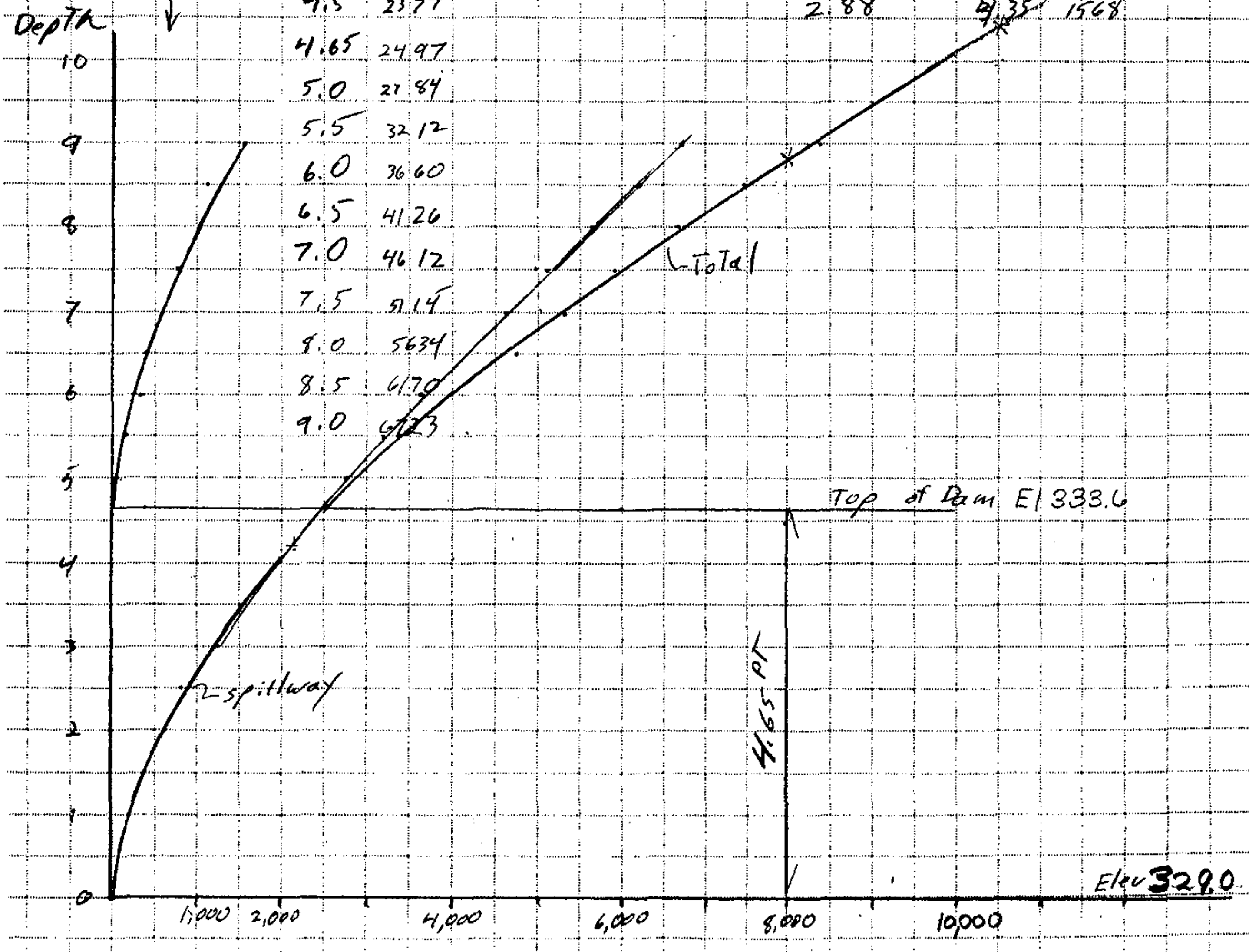
JOB Phase I Dam Inspection 4463
SHEET NO. 3 OF 9
CALCULATED BY KJP DATE 4/28/80
CHECKED BY BDC DATE 7/15/80
SCALE Stage Discharge

NAME OF DAM FACTORY

Assumed 100.00

$Q=CLH^{3/2}$

	Spillway I				Spillway II				Dam				
Elev	C	L	H	Q	C	L	H	Q	C	L	H	Q	QT
	2.61	75'	0.5	69					2.68	60'	.35	33	
	2.66	↓	1.0	199					2.68		.85	126	
	2.78		1.5	383					2.67		1.35	340	
	2.85		2.0	605					2.66		1.85	401	
	2.87		2.5	850					2.72		2.35	587	
	3.20		3.0	1250					2.73		2.85	706	
	3.32		3.5	1630					2.76		3.35	1015	
	↓		4.0	1992					2.79		3.85	1265	
			4.5	2377					2.88		4.35	1568	
			4.65	2497									
			5.0	2784									
			5.5	3212									
			6.0	3660									
			6.5	4126									
			7.0	4612									
			7.5	5114									
			8.0	5634									
			8.5	6170									
			9.0	6723									

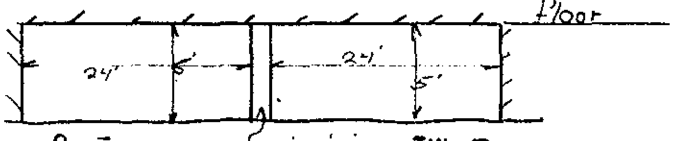


Project Factory Pond Dam **Designed By:** RJG **Date:** 7/3/80

Town: Georgetown **Route:** **Checked By:** BDC **Date:** 7/15/80

HYDROLOGIC AND CHANNEL INFORMATION

Downstream Culvert under Factory floor



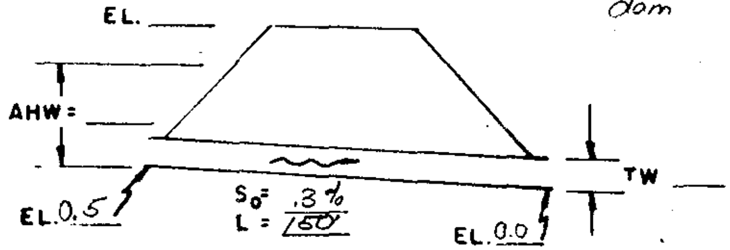
Q_1 = ______ TW_1 = ______

Q_2 = ______ TW_2 = ______

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 50' dnstm from dam



MEAN STREAM VELOCITY = ______

MAX. STREAM VELOCITY = ______

CULVERT DESCRIPTION (ENTRANCE TYPE)	½Q	SIZE	HEADWATER COMPUTATION: INLET CONT HW/D	INLET CONT HW depth	OUTLET CONTROL HW = H + h_o − LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW depth	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
	500	5'x 24'	.82	4.1	.5	.45	2.3	3.7	3.7			3.65	4.1			
	1000		1.3	6.5		1.8	3.7	4.3	4.3			5.6	6.5			
	1500		2.1	10.5		4.0	4.8	4.9	4.9			8.4	10.5			
	2000		3.0	15.0		7.5	5.0	5.0	5.0			12.0	15.0			
	3000		6.0	30.0		16.3	5.0	5.0	5.0			20.5	30.0			

SUMMARY & RECOMMENDATIONS

STORCH ENGINEERS
Engineers - Landscape Architects
Planners - Environmental Consultants

JOB 41163

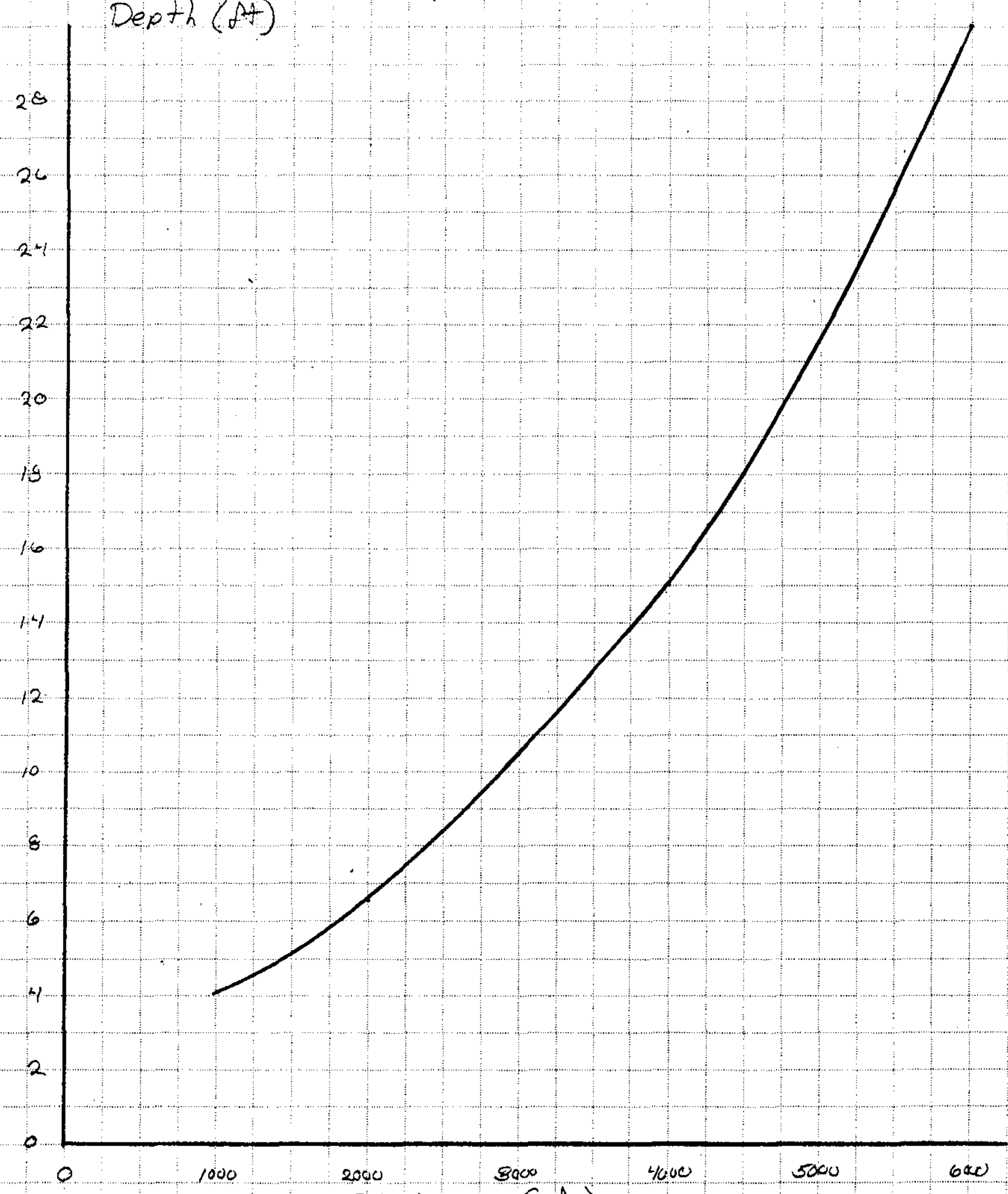
SHEET NO. 5 OF 9

CALCULATED BY GJG DATE 7/3/80

CHECKED BY BDC DATE 7/15/80

SCALE

Downstream Culvert Rating Curve



"Rule of Thumb" Guidance for Estimating Downstream Failure Hydrographs

NAME OF DAM FACTORY

Section I at Dam

1. S = 192 Acft
2. $Q_{P1} = 8/27\ W_b \sqrt{g}\ Y^{3/2} = 8/27\ (30) \sqrt{32.2}\ (23.4)^{3/2} = 5709$ cfs
3. See Sections

Section II at

4a. H_2 = 8.9' A_2 = 225 ft² L_2 = 800 V_2 = 4.1 Acft

b. $Q_{P2} = Q_{P1}\ (1-V_2/S)$ = 5587 cfs

c. H_2 = 8.9 A_2 = 225

A_A = 225 ft² V_2 = 4.1 Acft

$Q_{P2} = 5709(1 - 4.1/192) = 5587$

Section III at

4a. H_3 = 7.0 A_3 = 275 L_3 = 1000 V_3 = 6.3 Acft

b. $Q_{P3} = Q_{P2}\ (1-V_3/S)$ = 5393 cfs

c. H_3 = 7.0 A_3 = 275

A_A = 275 V_3 = 6.3 Acft

$Q_{P3} = 5587(1 - 6.3/188) = 5400$

Section IV at

4a. H_4 = 7.0' A_4 = 530 L_4 = 2100' V_4 = 26.0' Acft

b. $Q_{P4} = Q_{P3}(1-V_4/S)$ = 4630 cfs

c. H_4 = 6.5' A_4 = 500

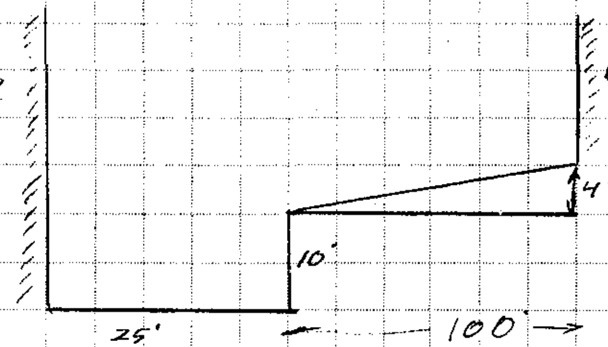
A_A = 515 V_4 = 25.0' Acft

$Q_{P4} = 5400(1 - 25/182) = 4660$

STORCH ENGINEERS
Engineers - Landscape Architects
Planners - Environmental Consultants

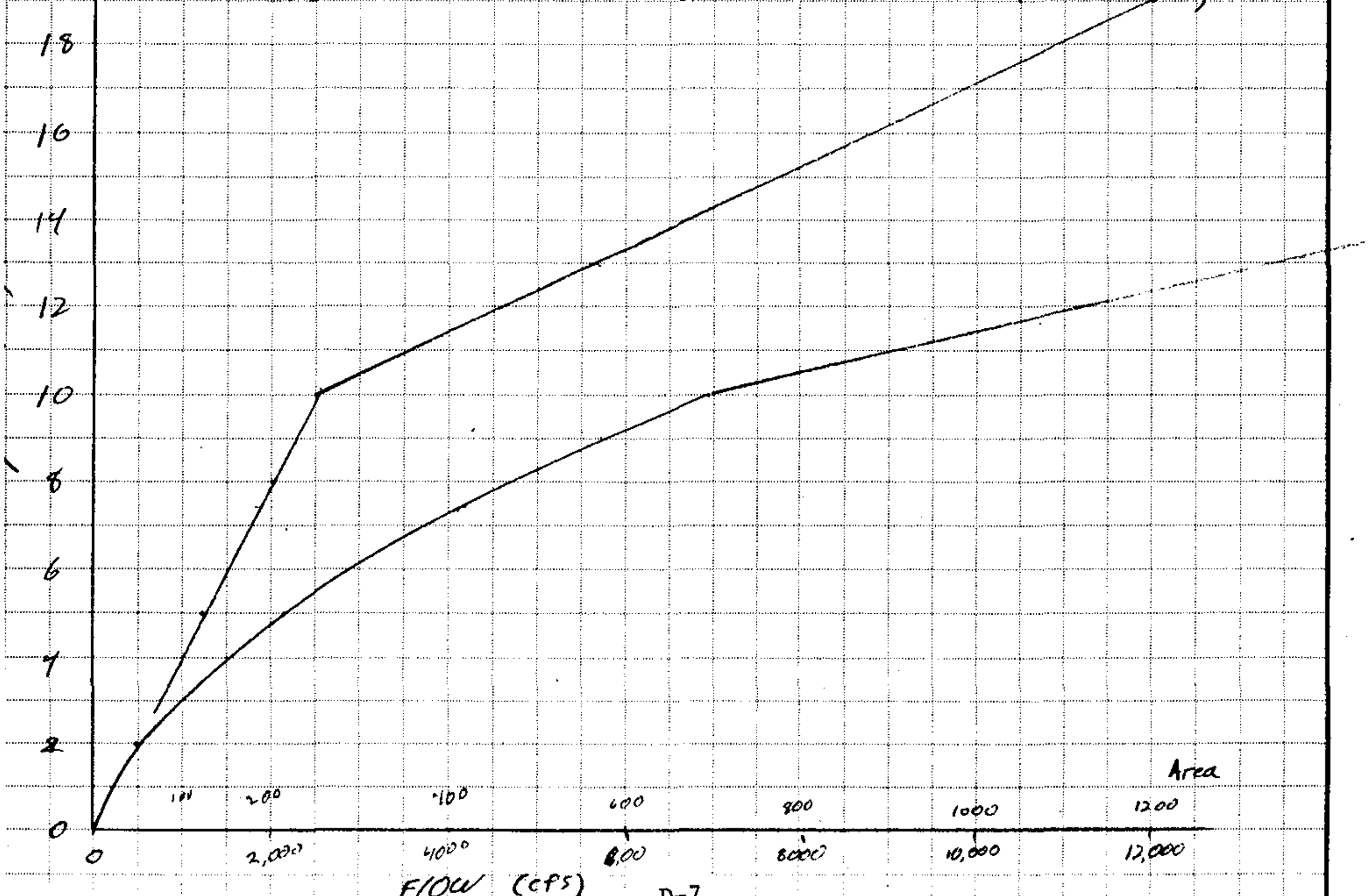
JOB 4463
SHEET NO. 6 OF 9
CALCULATED BY KJD DATE 7/3/80
CHECKED BY BDC DATE 5/15/80
SCALE SECTION II

rsT 800'



n = .035
s = 2%

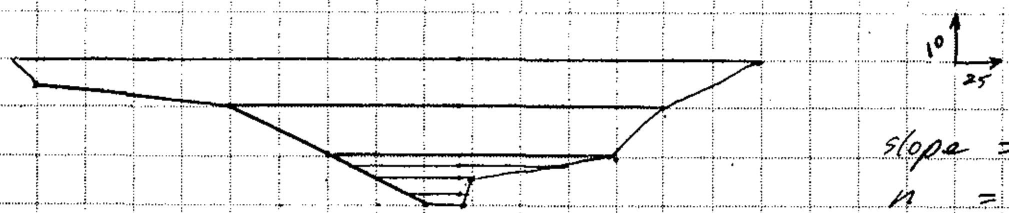
D	WP	A	R	$R^{2/3}$	$S^{1/2}$	V	Q
2	25	50	2	1.59	.1414	9.49	474
5	25	125	5	2.92		17.5	2183
8	25	200	8	3.99		23.9	4777
10	25	250	10	4.63		27.7	6928
20	125	1300	10.4	4.76		28.5	37034
30	150	2550	17.0	6.60		39.5	100,630



STORCH ENGINEERS
Engineers - Landscape Architects
Planners - Environmental Consultants

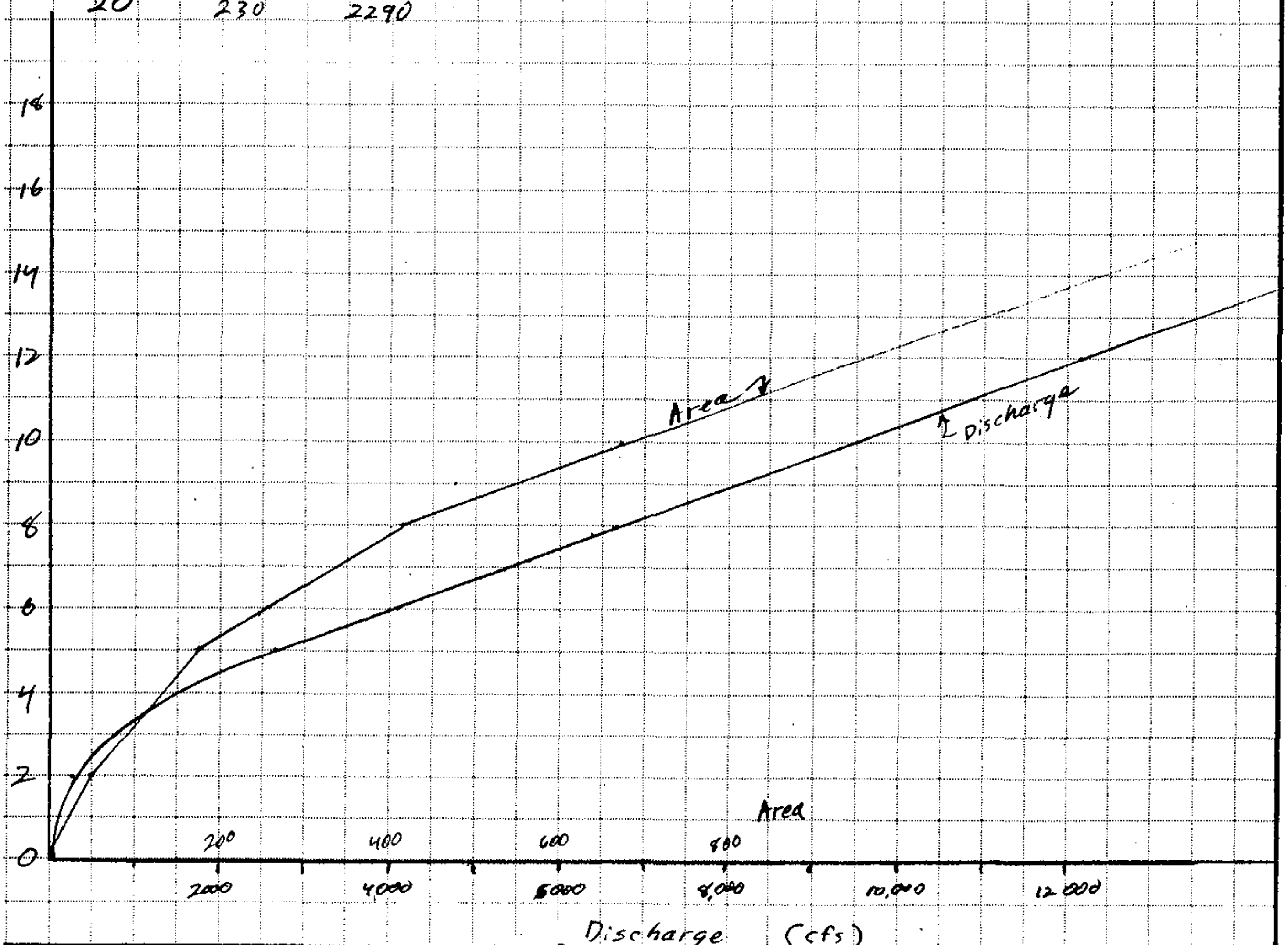
JOB 41463
SHEET NO. 8 OF 9
CALCULATED BY KJP DATE 7/3/80
CHECKED BY BDC DATE 5/15/80
SCALE SECTION III

800 → to 1800' Down stream



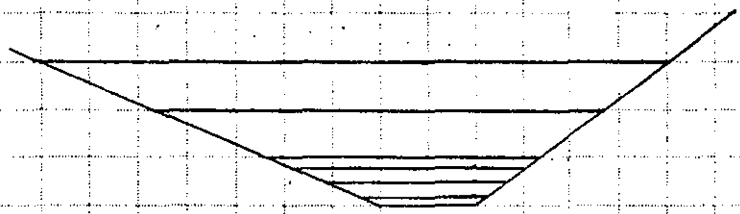
slope = 5%
n = .05

D	WP	A	R	$R^{2/3}$	$S^{1/2}$	V	Q
2'	30	50	1.66	1.405	.2236	9.30	280
5	50	175	3.50	2.303		15.24	2667
8	110	414	3.77	2.421		16.02	6650
10	150	675	4.50	2.725		18.07	12,176
20	230	2290					



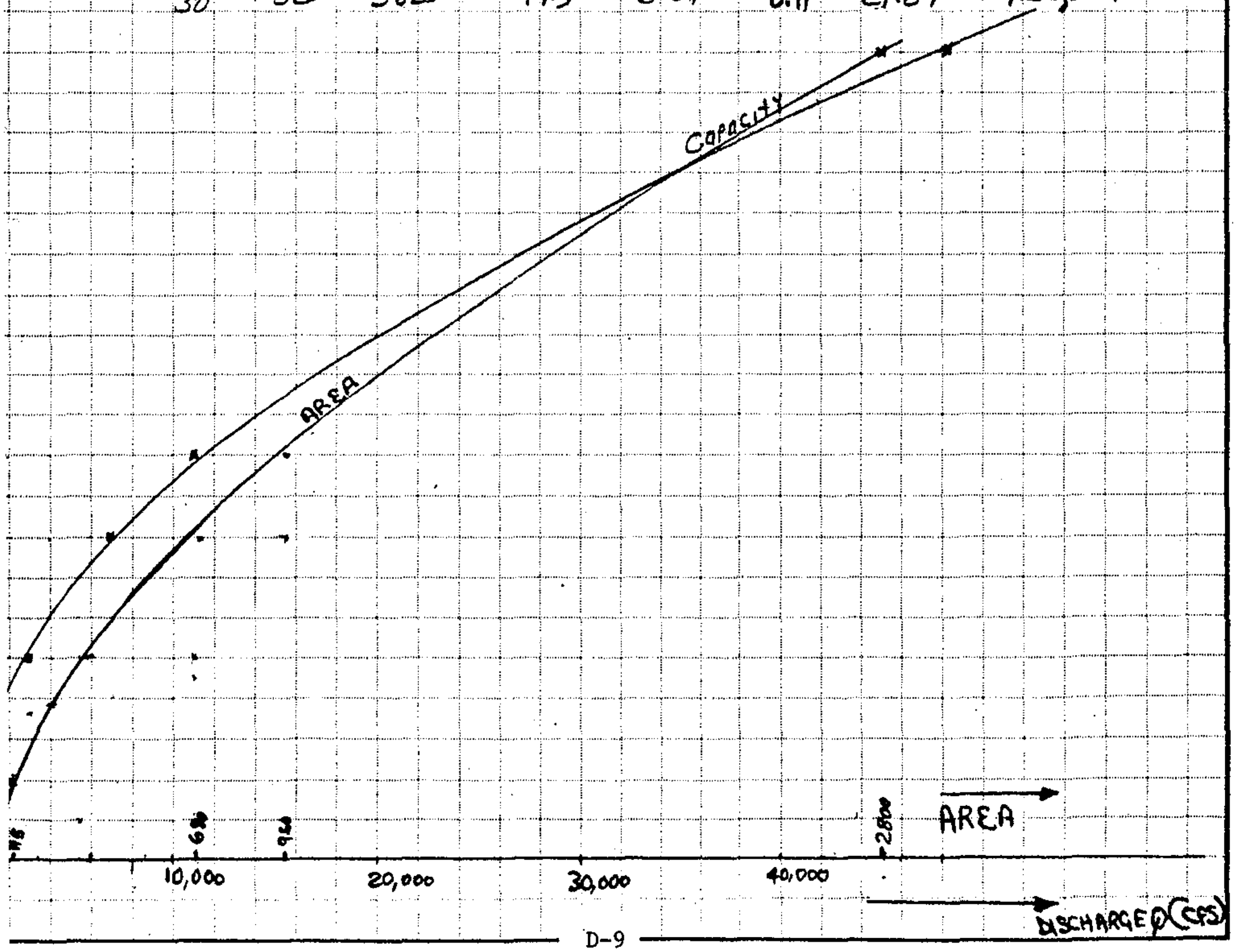
STORCH ENGINEERS/STORCH ASSOCIATES
Engineers - Landscape Architects
Planners - Environmental Consultants

JOB 41163
SHEET NO. 9 OF 9
CALCULATED BY KJP DATE 7/3/80
CHECKED BY BDC DATE 7/15/80
SCALE Section IV



$n = .05$
$s = 1.25\%$

D	WP	A	R	$R^{2/3}$	$S^{1/2}$	V	Q
2	65	115	1.77	1.46	0.11	4.77	549
5	93	358	3.85	2.46	0.11	8.04	2879
8	120	680	5.67	3.18	0.11	10.39	7069
10	140	950	6.79	3.58	0.11	11.70	11119
20	230	2800	12.17	5.29	0.11	17.29	48,423
30	325	5625	17.3	6.69	0.11	21.87	123,024



APPENDIX E

INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS